The Polygraph: Its Capabilities and Limitations in Security Clearances

There has been much interest and speculation recently in the possible expansion of the use of the Polygraph to include security clearances. The Polygraph is a delicate and somewhat complicated piece of machinery which has specific capabilities in the hands of an experienced and intelligent operator and also definite limitations. In the field of security it can be regarded only as an aid to interrogation, not as a substitute for present methods of security clearance.

THE Polygraph, commonly known as a lie detector, is a mechanical and electrical device which is used to detect and record certain physiological changes which are induced in an individual by his emotional response to certain questions, this response being involuntary for the most part. Relative changes in blood pressure, rapidity and amplitude of the pulse, variations in the respiratory pattern, and minute changes in the conductivity of the skin are detected by the instrument and recorded as a continuous graph or chart.

The Polygraph, therefore, performs three separate operations. First, a blood pressure cuff sends pneumatic impulses through a tambour assembly which is essentially a delicate bellows, the movement of which activates a pen which charts the rate of pulse, amplitude of the heart beat, variations in blood pressure and in general gives a picture of the heart in action. Next, a rubber expansion tube, held in place around the chest and activated by the movement of the diaphragm, causes a recording to be made of the respiratory pattern. The rate of breathing, shallowness or depth of respiration, blockage, muscular tremors and any other irregularity is recorded. Finally, a pair of electrodes, attached to the hand of the person being examined, are connected to an electrical circuit which also contains an amplifier unit. This assembly, usually known as the Galvanograph, is used to measure and record minute changes in the conductivity of the skin. The principle is much like that of a water wheel which, when two equal forces of water are directed against it, remains stationary. When the pressure of one force becomes greater than that of the other, the wheel moves in the direction in which the greater force is being applied. In the Polygraph the machine is adjusted to match the conductivity of the skin, the machine being constant as the skin's conductivity undergoes a change. That change is translated into the movement of a pen.

Blood pressure, pulse and respiratory patterns are considered to be the most reliable means of detection. The Galvanograph, which records changes in the conductivity of the skin, is reliable only in laboratory experiments. For example, a subject is asked to look at six or seven playing cards and to select one of them. He is instructed to lie concerning the card he has selected. A phlegmatic individual being thus tested in familiar surroundings and lying according to specific instructions will in an extremely high percentage of cases reveal his choice to the examiner. The deviation from his life-long training, plus the extra effort involved

in lying, sets up a sufficient emotional response to enable this sensitive apparatus to pick up the resulting physiological changes. Unfortunately the Galvanograph too often becomes erratic when used in actual cases. The precise factors involved are not too well known but

logical means consisted of requiring a witness or suspect to testify with a quantity of rice in his mouth. If the rice remained dry the individual was thought to be lying, on the theory that the salivary glands of such a person would dry up while he was giving untruthful testi-

The Polygraph records changes in the rate of pulse and heart beat, respiration, and in the conductivity of the skin. It is an aid which is sometimes of considerable value in investigations, but its value in effecting security clearance has been overstated. Scene from ONI Training Film.

the results indicate that this particular assembly is overstimulated and sets up secondary factors which result in a highly erratic graph not susceptible to diagnosis.

Attempts at detection of deception through psychological and physiological means may be traced back through many centuries. A typical attempt to ascertain the truth through physio-

mony. This rather crude attempt might nevertheless be considered basically sound in theory. From the psychological standpoint, suspects in a particular case were compelled to enter, one by one, a darkened room where they were instructed to grasp the tail of a donkey that reputedly would bray when touched by the guilty person. Unknown to the suspects, the animal's tail was

coated with a substance similar to lamp black. The hands of each individual would be examined when he returned from this room. The man with clean hands was indicated as guilty on the theory that the guilty person would refrain from touching the animal and thus hoped to escape detection. The first attempt to utilize an instrument similar to the modern Polygraph occurred about 1895. At that time Cesare Lombroso, the Italian criminologist[1] conducted several experiments on suspected criminals seeking to determine their innocence or guilt on the basis of changes, or absence of changes, in blood pressure and pulse. In the United States, in 1921, John A. Larson, working under Chief August Vollmer, of the Berkeley, Calif., Police Department, conducted several hundred similar tests. Beginning in 1925, Dr. Leonarde Keeler began experiments in California which he continued in the Scientific Crime Detection Laboratory at Northwestern University and in private practice until his death in 1949. With the aid of capable technicians and consultants, Keeler evolved the Polygraph as it is known today. His case histories exceeded 25,000, and he is generally conceded to have made the greatest single contribution to the science of the detection of deception.

Purely mechanical operation of the Polygraph to the point where the instrument is operating and producing a graph is a skill which can be acquired in a very short period of time. At this point the embryonic examiner is able to adjust the apparatus so that the blood pressure cuff, chest expansion tube and electrodes are transmitting the necessary impulses to the Polygraph and producing a graph. Here, comparatively speaking, the operator knows about as much as the medical student who has been shown a stethoscope, informed as to its name and purpose and told where to place it. The novice Polygraph operator can now produce a chart and the medical student is in a position to listen to a patient's heart beat. In both cases, only prolonged study and experience will enable each to make a correct diagnosis. In one case the problem is to diagnose the condition of the patient's heart on the basis of sounds heard through the stethoscope. In the other the Polygraph examiner must learn to interpret the charts which the instrument brings to him. This is by far the most difficult part of the examination and in its very nature allows for an almost infinite variance in skill among operators. The proficiency of the examiner, as in the case of any machine or instrument which requires interpretation or diagnosis, has an all-important bearing on the results obtained.

Two types of examinations are commonly used. One is called the "Peak of Tension Test," the other the "Specific Response Test." Claims regarding accuracy in these tests vary greatly. Certain examiners have made claims of as high as 99-percent accuracy. Such claims are exaggerated, and if made in good faith, are based on insufficient evidence and experience. On the other hand, they may be deliberate, with a knowledge or suspicion of the true facts. The best available statistics indicate that a highly skilled examiner, using the best instrument obtainable, will attain results in not more than 75 percent of cases. Such an operator will find that a small percentage of those examined, from 1 to 2 percent, are unresponsive. He will have

Preparing the Polygraph for use.

[1] Lombroso is also known for his erroneous theory that a unique criminal physiognomy existed which could be classified like finger prints.

a margin of error approximating 5 percent and in approximately 20 percent of the examinations his records will be too indefinite or too ambiguous to permit him to make conscientiously a positive diagnosis.

The "Peak of Tension Test" is generally considered to be the more reliable of the two most commonly used tests. Its disadvantage is that circumstances of a case very often forbid its use. An example of a hypothetical case might perhaps illustrate this more vividly than an abstract description. A burglary is committed in a certain city. The mode of entry, the method of forcing a strong box, the fact that jewelry only was selected, leads the investigator to select from the Police Department's MO (modus operandi) file, certain likely candidates, excluding those who are impossibles by reason of present incarceration, etc. A "Peak of Tension Test" may eliminate certain of these suspects, and may indicate the guilty person, provided, that a description of the articles taken has not been published or otherwise disclosed. A series of approximately 10 questions is prepared, each asking a suspect "Did you steal a pearl necklace?" "Did you steal a diamond stick pin?" All of the articles named in these questions are fictitious except one, which is located somewhere between the first and the last of the 10 questions, and is usually the sixth, seventh or eighth question. The questions are shown to the subject before the examination begins. Whether he is nervous or phlegmatic, it is obvious that his responses to these questions will be entirely insignificant, or erratic if he is innocent. If guilty, or if he has knowledge of the stolen goods through a disclosure to him by the actual burglar, he immediately sees and concentrates upon the one pertinent question concerning which he must attempt to conceal his emotions and lie. This results usually in a rather graphic increase in blood pressure up to the asking of this one pertinent question, with a decrease in pressure after the hurdle has been passed. It is obvious however, that in many or most cases, publication of details concerning an offense makes it possible for an individual being examined to react to a pertinent question because of knowledge acquired through innocent means.

The "Specific Response Test" consists in asking a series of relevant and irrelevant questions. The exact sequence of these questions differs among various examiners. These questions should be worded so as to permit an answer of either "Yes" or "No." This is most important in order that the respiratory pattern be undisturbed other than by the individual's emotional reaction to the question. In this test the most reliable indication of deception is a simultaneous change in respiration and increase in blood pressure immediately after an answer is given to a pertinent question. The change mentioned must constitute a deviation from the subject's norm—which norm must have been established previously. Unfortunately, this simultaneous indication is not seen in every case. Specific responses in either the blood pressure or respiration are more common. Decrease in blood pressure, change in pulse rate or an increase or decrease in the amplitude of the heart beat may also indicate deception, but a diagnosis of a chart as indicating deception must take into consideration every possible pertinent factor. The number of these factors is too great to be gone into in an article of this nature. Apparently contradictory indications of deception may appear, the clarification of which calls for the greatest care and skill in analyzing these contradictions and in reframing or utilizing questions which will produce the necessary elimination or clarification.

The greatest single factor which affects an untruthful response is the fear of detection and the extra effort used in the attempt to deceive. The conflict set up by a sense of wrongdoing or the emotion of remorse also contributes but in a minor way. There are many possible factors which may render a correct diagnosis of the Polygraph chart extremely difficult. These include emotional tension, such as nervousness in a guilty person, or tension aroused in an innocent person by the mere fact that a direct or indirect accusation has been made against him. Similarly, an innocent person may show indications of deception when he possesses a guilt complex surrounding an offense similar

to, but different from, the incident concerning which he is being questioned. Usually a skilled examiner is able to detect and eliminate from consideration indications prompted by these factors. Physiological abnormalities such as respiratory disorders or very high or low blood pressure and mental abnormalities such as feeble-mindedness (idiot, imbecile, moron, IQ range 0 to 70) or the presence of a psychosis (manic, depressive, schizophrenia, paranoia) together with psychoneurosis, tend to render a subject unfit for examination. In the case of mental abnormalities, irregularity of the respiratory pattern is usually present and constitutes a practical warning to the operator. Unresponsiveness of a guilty subject may be caused by lack of fear of detection, control of responses by a mental attitude, by a condition of subshock, by rationalization of the offense, or by prior extensive interrogation. This prior interrogation may itself produce a condition of subshock which might be described as the effects of adrenalin exhaustion. Rationalization of the offense occurs often in hardened criminals who are convinced that their conduct is completely justified.

Questions should be framed with the utmost possible precision. They should be short, avoid the injection of extraneous matter, worded so as to eliminate a false response caused by word association, and capable of being answered by "Yes" or "No" responses. The more knowledge an examiner has of a subject and the incident involved, the greater his chances of a successful examination. If possible, the subject should be balanced on a figurative point from which he may jump either into a black or white area—but only in either of these positions. In the "Specific Response Test" certain irrelevant questions are asked in order to establish a norm. Theoretically, it is possible that any apparently irrelevant question may be of the highest pertinency to the individual being examined. For example, an apparently irrelevant question such as "Are you married?" is utilized in order to help establish a norm. If the subject is married, a fact known to the examiner, but was caught by his wife a week before in flagrante delicto, a fact not known to the examiner, and faces divorce and the payment of large alimony, then this seemingly innocuous question may produce striking and startling results. While this is admittedly an extreme example, it may serve to illustrate the point that the more knowledge the examiner has of the subject he is to examine, the more precisely he may frame his questions in order to establish a true norm, and also avoid misleading indications caused by word association or by any of the other factors which tend to make a Polygraph diagnosis a delicate and often difficult operation.

The proper function of the Polygraph is as an aid to interrogation. Interrogation is a specific investigative technique which in almost all cases follows and does not precede those other investigative techniques which may be employed in a particular case. Utilization of the Polygraph alone as a security clearance technique cannot be recommended except in the most unusual cases where, because of particular circumstances, no other avenue of investigation is open. It should be restricted, if used at all, to cautious use by skilled operators, and considered merely as one of the techniques of investigation to which it can be a valuable adjunct. Used as an initial and sole investigative technique, the best coverage within the possibilities of the machine would require a gradual sharpening of questions after a somewhat blunt initial application. This would necessitate several separate examinations of the subject, each consisting of several runs in order that ambiguities might be resolved and contradictions be eliminated. As a process it would be time-consuming rather than time-saving, cumbersome and extremely limited in clearance value.

One of the most valuable applications of the Polygraph as an initial technique in an investigation occurs where several suspects are involved and where circumstances indicate that one of these suspects is guilty but where evidence points fairly equally to all of them. Elimination by use of the instrument is a valuable time-saver, but here the knowledge that the guilty person is one of a small and definite

group necessarily implies that a considerable amount of information concerning the circumstances of the offense or incident is available before the Polygraph examinations are made.

There is another important factor that cannot be overlooked in a discussion of the machine—the eliminating of evasion, deception, or "beat the machine" techniques sometimes employed by persons being examined. Falsification of Polygraph recordings in such a manner as to be imperceptible to the operator and not detectible by any distortion of the charts, has been achieved in laboratory experiments, and in turn met by effective countermeasures. There is, however, an inevitable time lag between the initiation of a specific evasion technique, its recognition, and the employment of effective countermeasures. *It is therefore possible that presently unknown evasive techniques may be developed. If so, it would have to be assumed that subversive individuals attempting to infiltrate the government would be adequately briefed in their use.* It follows that any policy predicating security clearances on results from the machine alone, without utilization of the more orthodox investigative techniques, contains a margin of error too great for comfort, and could conceivably constitute an enormous aid to disqualified persons attempting to penetrate the security defense of the government.

The Polygraph is a valuable tool when properly utilized and when entrusted to a skillful and conscientious examiner. Its limitations are recognized by the courts which will not admit it as legal evidence. The Navy is at present contributing to a research project which is attempting to explore the field of deception criteria, recognizing that research into examination methods has not kept pace with development of the mechanical aspects of the machine itself. Many, if not most, experienced operators will decline to diagnose charts resulting from an examination not conducted in their presence. This attitude points not only to a lack of standardization as to what constitutes deception criteria, but also strongly indicates that many experienced operators, who usually are also experienced interrogators, consciously or otherwise place considerable reliance upon their own observation of a subject and often secure a confession following a Polygraph examination and then read into the chart deception indications which agree with the confession they have received.

With the present great expansion of the defense establishment, a method which gives promise of quick security clearances is certain to be examined with interest. The Polygraph is a valuable adjunct to the many investigative techniques which are utilized to scrutinize and establish the loyalty of individuals who are to occupy sensitive positions. However, an improper use of this instrument will produce security clearances which are worse than nothing in that they give a dangerous illusion of security which might in particular instances result in the most far-reaching and dangerous results.